

Astride Tradition and Modernity: Rizhao as China's Urban Future?

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Abstract: Located in an area of great antiquity, Rizhao, a prefectural city of 3 million in China's Shandong province, is both a victim and beneficiary of its long history. When China liberalised in 1978, many industries locating in Shandong brought environmental devastation. However, its antiquity endowed the area with a rich cultural heritage ripe for tourism as an alternative "pillar industry" to other economic pursuits. The city's fame as having the most sunny days in China not only helped tourism but also promotes the use of solar energy. However, its success in the midst of highly competitive neighbouring cities is not coincidental. Credit must go to city planning and the city government which seeks to capitalise on its "green" credentials and historical legacy to augment its traditional strategy of becoming a coastal marine industry base, regional logistical centre, and marine technology zone. Whether this model represents China's urban future remains to be seen; it has nevertheless many features superior to many cities in China.

Keywords: Intangible cultural heritage, marine industry, solar energy, urban development, spatial planning

JEL classification: J21, N75, N95, O13

1. Introduction

By virtue of their size, complexity and dynamism, China's metropolitan centres have hogged the limelight. But the county's secondary or even smaller cities have their own distinctiveness that can cement their significance. Yiwu, for instance, a small city of

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just over a million people, boasts the world’s largest market for petty traders (Li, Wang, & Cheong, 2016). China is also a land of antiquity and its cities often boast long and eventful histories. This is an advantage Chinese cities have over many cities with more recent origins. Beyond the possession of these assets, how a city distinguishes itself depends on the promotional and developmental role of its government. This paper demonstrates the pivotal nature of this role.

Situated at 35 25N, 119 26E, Rizhao, a prefectural level coastal city of 3 million inhabitants in Shandong Province in East China (Figure 1), exemplifies the traits mentioned above. Rizhao is located in Shandong Province, labelled as “one of the birthplaces of ancient Chinese culture” (China.org.cn, 2010). The province is a land of great antiquity, with Neolithic cultures like Long Shan and Dongyi flourishing between 5,000 and 2,000 BC. Within the province lies Qufu, the birthplace of the sage Confucius (551–479 BC). Like its surrounding areas, Rizhao dates back to 3,500 BC to 2,000 BC during which period the ancient tribe of Dongyi ruled the city. It was first named Rizhao during the Song Dynasty (Rizhao Website, 2018). Rizhao is located at the centre of both the above cultures, from which sun-worship and many rituals developed. Unfortunately, Shandong has been both a beneficiary and victim of China’s rapid development over the

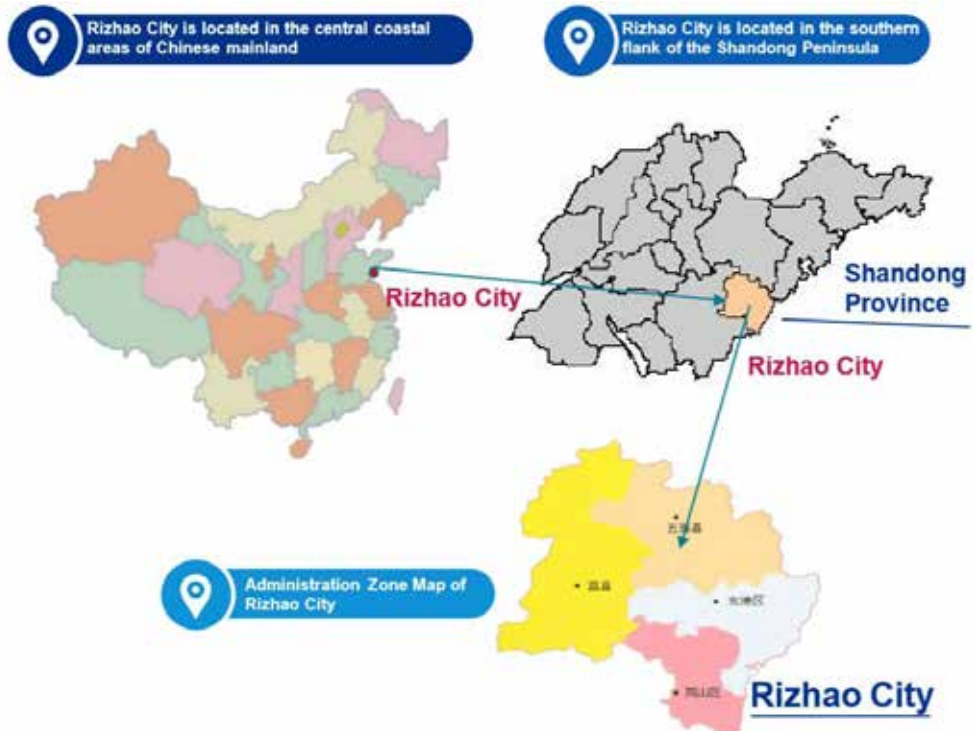


Figure 1. Rizhao Geographical Location and Administration Map

Source: Rizhao government website, http://english.rizhao.gov.cn/uploads/file/20170623/20170623205218_77703.pdf

last several decades, with heavy industries located in the province bringing pollution and devastation to the environment (Ju, An, Ling, Shi, & Shen, 2018).

In the midst of this complex environment the Rizhao city government saw its port as having the best potential to help the city develop. This strategy has therefore dominated its several master plans. Attracting labour-intensive industry to Rizhao was also one of the development agendas proposed. Tourism has also been on the city planners' radar.

But early recognition of the environmental consequences of this traditional approach to development caused the Rizhao city government to shift strategy to focus on promoting activities that stressed sustainability. One logical response to the heavy pollution is to turn to alternative energy sources to fossil fuels. Equally logical is the choice of solar energy, given the many sunshine days for which the city is famous and which gave the city its name. Another strategy is to leverage the city's many cultural assets to promote tourism as the alternative to heavy industry. A prosperous tourism industry requires the sustainability of the city's cultural heritage – the ability to showcase history, folk traditions and rituals, year after year. Thus, Rizhao's focus on sustainability rests on two pillars – solar energy and cultural sustainability to promote tourism. Both are now key to the city's economic sustainability.

This paper documents the city's urban development model. It is organised as follows. In the next section, we review the city's administrative structure, spatial planning through functional specialisation, and the role of successive urban master plans undertaken in the context of city spatial planning. This is followed by the municipal government's role in the city's economic development which provides not only a profile of the city's recent past but also a glimpse of the city's strategic future. The city's two-pronged strategy of ensuring sustainability receives attention in the following two sections. Section 6 concludes the paper.

2. Urbanisation, Spatial Planning and City Development

Like other metropolitan areas in China, Rizhao is a product of its spatial development. However, the nature of spatial development depends crucially on the extent of China's urbanisation, the scale of which was said to be "without precedent in human history" (Seto, 2013). When China began liberalising its agriculture in 1978, the increased productivity would have led to surplus labour that generated rural-urban migration in the manner of the Lewis model (1954). That this did not occur was the result of special circumstances that rendered inapplicable conventional theories of rural-urban migration (Zhou et al, 2018). The first was the rise of town and village enterprises (TVEs – urban collective enterprises) that absorbed most of the displaced labour. The second was the implementation of the household registration system (HRS) that disadvantaged rural residents relative to their urban counterparts. So what was this "unprecedented" urbanisation? This resulted from extensive redistricting of rural areas as urban as city administrations sought to take advantage of land being classified as "urban" (Eggleston, Oi, & Wang, 2017). Among those who moved, they left their rural residences unoccupied, giving rise to "hollowed out" villages (*kongxin cun*), that city governments took advantage in launching "new rural construction" (Wang, Zhang, &

Cheong, 2014). Most recently, another reform adjustment consisted of “bottom-up” “rural rejuvenation” in which the local population became stakeholders in rural policy-making (Long, Zhang, & Tu, 2019).

None of these initiatives fits the conventional Lewis model in terms of the scale of rural-urban migration. Not surprisingly, unlike in the west where the role of spatial development remains contested¹, China has no qualms about the virtue of spatial planning (Wu, 2015), seeing it as an ally of urban growth. This focus notwithstanding, the reality is that China faces the dilemma of a trade-off between turning metropolitan areas into engines of growth but increasing regional disparities, with different provinces taking different routes to development (Jaros, 2016, p. 1). While regional imbalance is said to characterise most Chinese cities (Shen, Teng, & Song, 2018), some provinces like Jiangsu have adopted a more balanced approach to regional development and managed to achieve more inclusive growth (Wong, Qian, & Zhou, 2008). And with the rise of green economy concerns, many cities are aspiring to be “low carbon” cities (Pan, Tang, Wu, Lu, & Zhang, 2008).

Located in a densely populated area with several cities much larger nearby, Rizhao is able to leverage off its locational advantages but is also constrained by locational disadvantages. The city’s spatial development is attributable to three sources, all of which reflects the role of the municipal government. The first source is the city’s administrative set-up. Development roles are defined not only by administrative level but also by function. In terms of the former, Rizhao, like most prefectural cities, has three administrative levels with responsibilities diminishing the lower the administrative level (Table 1). The highest level is the Rizhao municipal government. The next level consists of 2 districts, 2 county-level cities and 2 special (1 development and 1 tourist) zones. The population of these sub-jurisdictions ranges from 85 thousand to 1.127 million with GDP ranging from RMB1.97 billion to RMB46.95 billion. The third and lowest administrative hierarchy is made up of the 40 townships and 11 urban communities. The urban communities within townships are in charge of specific streets. Below the level of townships and communities are 1,566 village management systems that have been voluntarily organised; they are not part of the official administrative hierarchy.

A second source of spatial development is the specific economic role assigned to each area and is endowed with infrastructure that supports this role. Thus, Donggang District, with its port supported by a well-functioning road transportation system is the most economically advanced area in Rizhao. Its prosperity has spilled over to its neighbouring districts that are seeing the emergence of commercial activities and machinery manufacturing industries along their shared borders with Wulian city (Rizhao Municipal Government, 2004). Secondary industries especially iron manufacturing

¹ While Ariffin (1977) surveyed regional development and growth theories which help to explain the spatial distribution of economic activities” and Capello (2009) documented a large number of approaches, theories and models for the interpretation of regional choices and regional development trajectories, both recognised the growth potential of spatial development. Less positive are Kim (2008), who attributed inequalities to spatial development, and even worse, Boland (2014, p. 770) was even more negative on spatial planning and economic competitiveness, dubbing it “a dangerous obsession”.

Table 1. Rizhao's administrative structure and regional social-economic performance in 2016

	Number of			Population (10,000)	GDP (RMB 100 mil.)	No. of enter- prises ^b
	Townships	Communities	Villages			
Donggang District	7	3	476	71.89	469.54	83
Lanshan District	6	2	230	42.98	465.30	75
Ju County-level City	18	1	82	112.69	329.74	201
Wulian County-level City	9	1	100	51.48	219.97	224
Rizhao Development Zone ^a	–	2	136	12.17	332.87	68
Shanhaitian Tourist Zone ^a	–	2	542	8.52	19.73	6
Total	40	11	1,566	299.73	1,837.15	657

Notes: ^a Rizhao Development Zone and Shanhaitian Tourist Zone are made up of urban communities. Rizhao Development Zone has administrative jurisdiction of Beijing Road and Kuishan Street, while Shanhaitian Tourist Zone covers Wolongshan and Liangcheng Streets.

^b The number of enterprises refers to the number of enterprises above a given size. Only enterprises with annual income above RMB20 million are included.

Source: *Rizhao Statistical Yearbook 2017*.

and wood processing industries are concentrated in Lanshan District (Rizhao Lanshan District Government, 2018), this sector accounting for 58.45% of the district's total output (Rizhao Statistical Bureau, 2017).

Another distinct area is the Rizhao Development Zone, where secondary industry made up an even larger percentage (71.14%) of the zone's GDP (Rizhao Statistical Bureau, 2017). Established in 1992 and upgraded in 2010 as a national level development zone, Rizhao Development Zone is built as the national environmental-friendly industrial zone, incubating automobile and auto parts manufacturing (Rizhao Development Zone, 2018).

Unlike these jurisdictions, county-level cities Ju and Wulian as well as Shanhaitian Tourist Zone are equally developed in both secondary and tertiary sectors. Ju city, with its Zhaoxian Town, Chengyang Town, Liuguanzhuang Town and Xiazhuang Town, is located along National Highway 206, and contains a cluster of marine chemistry industries and advanced network information technology industries (Rizhao Municipal Government, 2004). Wulian specialises in electrical appliance manufacturing (Rizhao Wulian County-level City Government, 2018), while Shanhaitian promotes coastal tourism (Shanhaitian Tourist Zone Government, 2018).

Given these diverse activities, the pillar industry for the city as a whole is now the tertiary sector; its value of output accounting for 62.71% of its GDP in 2016 (Rizhao Statistical Bureau, 2017). This sector includes its growing coastal and cultural tourist and logistics industries which are given increasing developmental priority (Rizhao Donggang District Government, 2018).

With respect to the third source, and in common with other cities in China (Wang and Shen, 2014), Rizhao's development is the outcome of a series of development plans. In its early phases, Rizhao's development was traditional and unremarkable. Its focus on marine activities was spurred by the 1982 construction of neighbouring Shijiu

Port, about 20 kilometres from Rizhao downtown. In 1986, Shijiu Port was incorporated into Rizhao, which was then upgraded from a county-level to a prefectural level city in 1989. The first city master plan in 1994 envisaged the city growing in a series of rings radiating from the city downtown. A new downtown, today's Donggang District, was built between the old downtown and Shijiu Port. In this Plan, the municipal government put forward the 'Port City' concept, aiming to turn Rizhao into a coastal open city focused on its port, commercial trading and tourism (Rizhao Municipal Government, 2004). This concept has remained fundamentally intact since.

Another traditional strategy was to give priority to labour-intensive industries. Lanshan Economic Development Zone was to house these industries. In 2004, this Development Zone was upgraded to Lanshan District with the new Lanshan Port (southern part of Rizhao Port), forming another urban centre (Rizhao Lanshan District Government, 2018).

These strategies continued to drive Rizhao's 2005-2020 City Master Plan. In this plan, the Rizhao Municipal Government confirmed that port development would drive economic growth (Rizhao Municipal Government, 2004). To this end, port related industries were developed, but the strategy of promoting labour-intensive industries was reversed. Instead, development of port related manufactures was encouraged.

As a major departure from traditional development strategies, however, tourism was added as a pillar industry to drive Rizhao's tertiary sector. Environmentally, Rizhao was selected as the pilot city to implement sustainable development. Leveraging upon Rizhao's ranking in the top tier of Chinese cities in terms of air quality, water quality and ocean protection, the Rizhao Municipal Government saw the city having the credentials to become a tourist city. With abundant ocean resources, the government worked simultaneously to transform the city from being a sailboat base to a "Water Sports City".

Finally, development of the trading and commercial sectors would be accelerated by the construction of the New Eurasia Continental Bridge. Together with other priorities of port development and tourism promotion, Rizhao's plan was to promote itself as the economic centre of South Shandong.

The latest city master plan was launched in 2015, with Rizhao becoming a part of the "cluster economy". While sticking with the 'Port City' brand, Rizhao also plans to utilise the coastal area to drive inland development through the application of agglomeration theory in city planning (Rizhao Municipal Government, 2016). This requires spatial reconfiguration to allow the city to concentrate its activities to achieve economies of scale. This translates specifically into the city being transformed spatially into "Double Downtowns, Double Zones and Multiple Clusters". The double downtowns refer to Donggang and Lanshan Districts, where the ports are located. Radiating from these two districts, the surrounding hinterland would be progressively developed economically. The double zones, namely, Shanhaitian Tourist Zone and Sun Culture Tourist Zone, are to be further developed as "coastal culture areas". The clusters are mainly centred in towns (Heshan Town Cluster, Houcun Town Cluster and Beikuo Town Cluster) and intended to provide economic balance to the regional economy.

In addition, Rizhao mapped out its own "One Coastline, Two Centers and Four Development Corridors" spatial development plan (Figure 2). Still relying on port development, the coastline is to accommodate two urban centres: Rizhao downtown

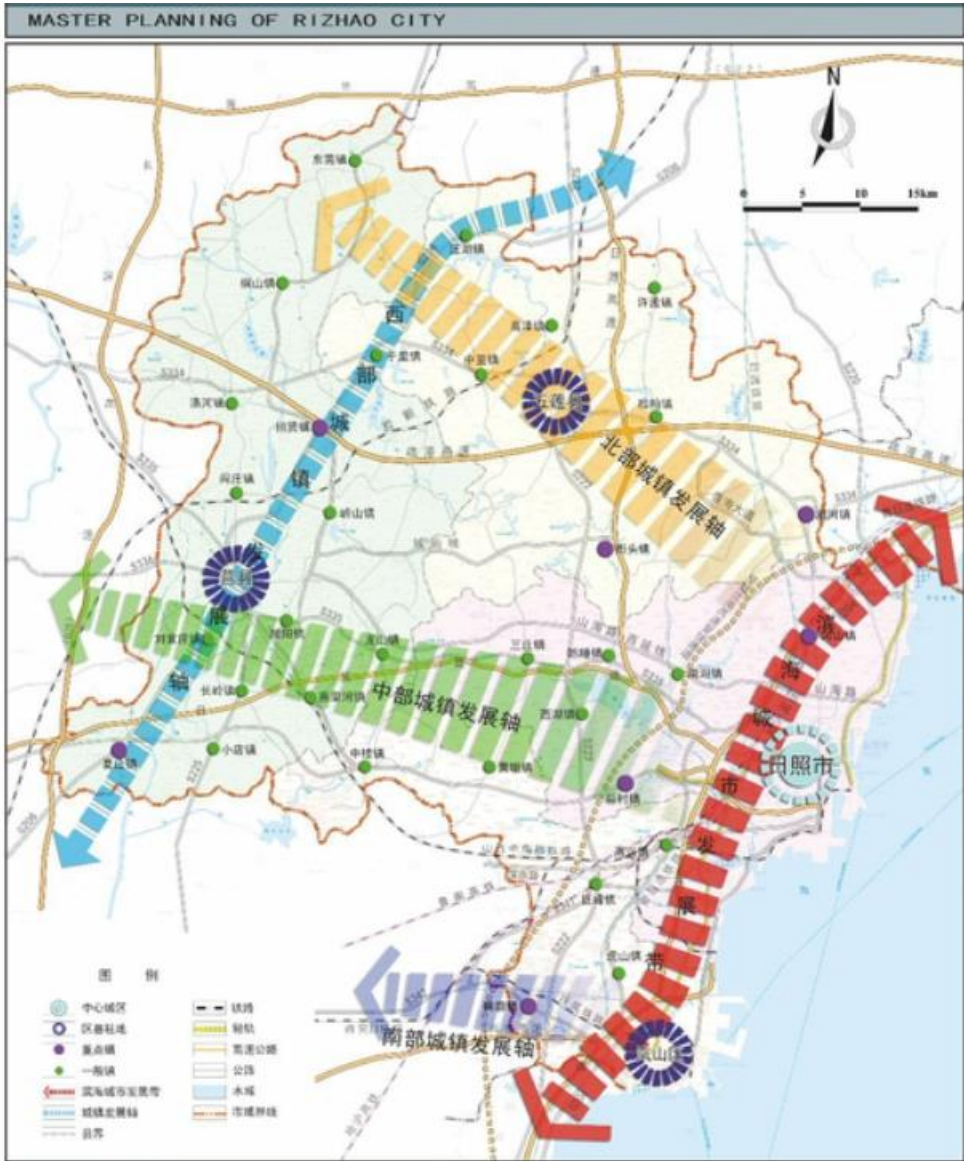


Figure 2. Rizhao's Spatial Development Strategies in 2015 City Master Plan
 Source: Rizhao Development and Planning Bureau (2016) Rizhao City Masterplan 2015-2030.
 Available at <http://www.rzxx.com/news/51582html>

(mainly Donggang District) and Lanshan District. Through enhancing socioeconomic links between Donggang and Wulian City, and between Donggang and Ju City, the north and middle developmental belt will be expected to emerge. The link between Lanshan District and the inner city should see the emergence of the southern belt. The western belt then links the inner Rizhao belt to the coastal area.

Thus, Rizhao's main spatial development has been centred around the port from the very beginning. Urban expansion after the 1994 Master Plan was a consequence of the port's prosperity. This then led to the emergence of port-oriented industries that further enlarged Rizhao's urban outskirts. New activities – marine related industrial development and tourism – were enhancements to City Master Plans 2005 and 2015, with the latter further stressing the ecological-friendly concept for city development. This is reflected in the city plan slogan shifting from “Urban Survival Through Port Construction” to “Urban Survival Through Environmental Protection”. These broad principles have been refined to promote cultural and ocean tourism, and at the same time promote solar energy industry.

3. City Development and the Role of Government

In terms of driving economic growth, the elaborate city plans have borne fruit. Statistics show that Rizhao's economy has experienced steady growth, its GDP reaching 180.25 billion yuan, in 2016, having grown 7.9% over the previous year (Table 2). During the national 15th Five-Year-Plan period (2011-2015), Rizhao's average GDP grew at 10.4% per annum, higher than the national and provincial averages of 8% and 9.4% respectively. Per capita GDP increased even faster at 23.3% over the last decade from RMB18,718 in 2006 to RMB62,358 in 2016. Meanwhile, Rizhao received considerable investment. Fixed assets investments during the 15th Five-Year-Plan period rose at an annual average rate of 18.6%. In 2016, the city received RMB159.78 billion, about 13.5% higher than a year before. The improvement in economic structure is reflected in changes in the primary:secondary:tertiary sector ratio from 9.3:54.8:35.9 in 2010 to 8.1:47.3:44.6 in 2016 (Rizhao Statistical Bureau, 2017).

Table 2. Rizhao's economic indicators, 2006-2016

	GDP (100 million)	Primary sector (100 million)	Secondary sector (100 million)	Tertiary sector (100 million)	Fixed assets investment (100 million)	GDP per capita (yuan)
2006	505.87	71.82	248.08	185.97	235.09	18,718
2007	629.58	82.82	315.71	231.05	351.13	23,180
2008	774.22	80.02	413.11	281.09	518.43	28,340
2009	864.66	84.30	471.85	308.51	631.86	31,451
2010	1,025.08	95.87	561.55	367.66	775.36	36,870
2011	1,214.07	107.36	660.66	446.05	880.69	43,191
2012	1,352.57	112.49	724.06	516.02	922.38	47,851
2013	1,500.16	125.83	774.03	600.29	1,069.05	52,778
2014	1,611.87	133.15	811.66	667.03	1,234.75	56,349
2015	1,670.80	140.60	813.06	717.14	1,407.81	59,110
2016	1,802.49	146.97	851.94	803.58	1,597.78	62,358

Source: Rizhao Statistical Bureau 2017.

These impressive statistics mask the fact that Rizhao suffers deficiencies like lower connectivity and competitive disadvantages compared to its neighbouring cities. The Shandong Peninsula's proximity to Korea and Japan has helped it to absorb large amounts of foreign investments from these countries. To attract these investments, many Shandong cities especially Weihai and Qingdao offered investors tax and land lease privileges. For instance, the Qingdao municipal government had exempted payment of income tax for all foreign investments over US\$30 million in energy, transportation and port construction sectors since 2000 (Shandong Provincial Government, 2000). They were pioneer cities for accommodating the outsourced overseas manufactures. Having accumulated considerable experience in labour intensive production, they also became familiar with the standards required by Korea and Japan. As a latecomer to foreign investment, Rizhao had to play catch-up in logistics efficiency and standards compliance. In addition, with its rigid policies of land management, Rizhao was unable to provide the land privileges that Qingdao and Weihai offered.

Its competitive disadvantages relative to these cities are also reflected in the larger share of the primary sector and in its less developed tertiary sector as well as its GDP per capita (Table 3). Beyond it, the city has fewer economic connections with neighbouring cities. Based on the measurement of its 'Economic Connection Ratio'², Zhao, Wu, He and Song (2007) found that Rizhao relied mainly on Qingdao and Linyi in terms of its economy, while it did not interact much with other neighbouring cities.

Table 3. Economic structure of Rizhao and neighbouring cities in 2017

	Rizhao	Yantai	Qingdao	Weihai
GDP per capita (yuan)	68,848	103,706	119,357	126,785
Economic structure (% GDP):				
Primary sector	7.5	6.5	3.4	6.8
Secondary sector	48.1	50.1	41.2	45.4
Tertiary sector	44.4	43.4	55.4	47.8

Source: Data compiled from Rizhao, Qingdao, Weihai and Yantai Cities Statistical Yearbooks 2018.

The above disadvantages are mitigated somewhat by Rizhao now being able to accommodate industries moving out of Qingdao, thanks to the completion of the Qingdao Cross-sea Bridge that allows a road journey from one city to the other in just one hour. This means Rizhao can benefit from Qingdao's agglomeration economies.

But credit for Rizhao's growth should also be given to the role of the city government whose spatial planning initiatives were discussed earlier. This role builds on the prominence accorded by higher levels of government to the importance of and benefits derived from Rizhao Port, listed as one of the top 10 deep water ports in China (Jiang, 2017). It was China's second largest port in shipping coal and cement, with 39

² The Economic Connection Ratio is used to measure the economic connection between two cities or between city downtown and its surrounding area. The formula is $R_{ij} = (\sqrt{P_i G_i} * \sqrt{P_j G_j}) / D_{ij}^2$, where R_{ij} refers to the economic connection between two areas. P_i and P_j represent the urban population of the two areas, while G_i and G_j are the GDP of area i and area j (Zhao, Wu, He, & Song, 2007).

productive berths, and 32 ten-thousand-ton berths, among which, 2 are China's largest fifteen-thousand-ton berths for loading and unloading coal (Sun, Lan, Zong, & Yang, 2011). Rizhao port functioned as a natural resource logistical centre, mainly for coal shipments to provide raw material to Shandong's iron industries.

From 2010, and in response to the central government and provincial government master plans, the city government also envisaged Rizhao becoming a coastal marine industry base, regional logistical centre, cultural and tourist city and marine technology zone (Sun, Lan, Zong, & Yang, 2011). The city was to be a component of a national-level plan called "Shandong Peninsular Blue Economic Zone" launched in 2009 which have as its objective Shandong becoming the pioneer for China in developing its marine economy. Shandong was to form China's first marine economic development zone with over 70 ports and 55 marine research institutes as well as having rich experience in hosting outsourced marine industries from overseas. This zone was to consist of 9 areas, each with distinct functions like marine chemistry, marine energy, marine equipment manufacturing and marine technology (Cheng, 2014).

Rizhao's role was to develop marine-related secondary industries: iron manufacturing, shipbuilding industry, petroleum industry and marine machinery manufacturing. This plan called for the improvement of local infrastructure such as further developing Rizhao Port's cargo throughput capacity, building the Qingdao-Rizhao-Liangyungang Railway and linking Shanxi to Rizhao through railways. Further, the logistics system would be upgraded by the build-up of the Rizhao Bonded Logistic Centre.

Rizhao was also part of the provincial Shandong City Cluster Plan launched in 2004. In this plan, it was mapped out as "Two Centres, Four City Clusters" that stressed the economic interaction between cities (Shandong Provincial Government, 2005). Rizhao's role was to develop the Rizhao-to-Qingdao-Weihai Marine Industrial Zone, to expand Rizhao's urban area to incorporate its county-level cities (Yingnan, Yinan, Feixian and Linshu) to form the Great Rizhao metropolitan area. In forming this urban cluster, Rizhao was to link closely with Linyi.

In tandem with these national and provincial plans, the city government's plans centred around its port (already described) had also become more elaborate with each master plan. From early efforts to attract labour-intensive industries, the city has shifted its stance to focus on high-tech industries and service sector activities (Jiang, 2017). Table 4 shows the industries targeted in each of Rizhao's development zones.

Important as these initiatives are, the city government recognised that they cannot help the city catch up with cities like Qingdao and Weihai into which the provincial government had poured considerable resources and which foreign investors have long favoured. In a breakout from traditional strategies, the city embarked simultaneously on a strategy centred around Rizhao's two unique comparative advantages – its green credentials and historical legacy. This strategy is encapsulated in a single word – "sustainability". We turn to an examination of this strategy next.

4. Into the Future – Driving Green City Growth

The first pillar of this strategy is to pursue the national strategy of harnessing alternative energy by leveraging the city's free asset – abundant sunshine. As the city's name

Table 4. Industrial development areas in Rizhao

Developmental area	Industries
Rizhao High-tech Industrial Development Zone	Electronics, information technology, e-commerce, new materials manufacturing, biological medicine
Shibei Economic Development Zone	High-tech agricultural equipment, electronics, home appliances
Ju County-level City and Haiyou Economic Development Zone	Chemical industry, processing industry for agricultural products, environmental protection equipment manufacturing, new energy industries
Lanshan Economic Development Zone	Modern logistics industry, aquaculture cultivation and processing industries, timber processing industries
Rizhao Development Zone	Automobile and parts industries, health food manufacturing, paper printing and packaging, biological medicine industry
Rizhao Port Area	Port logistic and storage industry, information service industry, cold chain logistics, trading and financial industries
Rizhao Konggang New Area	Aviation service industry, Aviation bonded logistics
Shanhaitian Tourist Zone	Cultural tourism, leisure and vacation industry
Wulian Mountain Tourist Zone	Mountain sports industry, mountain tourist industry
Sun Culture Tourist Zone	Cultural tourism

Source: Various development zone websites.

Rizhao, which means “sunshine” suggests, its claim to fame is that it has over 200 sunshine days a year; its average temperature of 12.7 degrees is also relatively mild compared to Qingdao and Weihai. It has invested heavily in solar energy, with the objective of achieving “carbon neutrality” through implementing a “circular economy”. Carbon neutrality, the ability to balance the amount of greenhouse gases emitted with the amount it eliminates, has seldom been attempted, let alone achieved by other cities in the world (Biello, 2008). The circular economy that implies the absence of waste – the waste produced by one activity or process is used as input to another – has been applied to a number of activities in Rizhao, including the Luxin Jinhe Biochemical Company citric acid plant (Biello, 2008).

This strategy is built on three principles, all with the aim of reducing the costs of renewable energy and rendering its use more attractive to residents. The first is the focus on retrofitting as opposed to building new eco-friendly premises. The second is R&D to lower production costs of renewable energy equipment. And the third is to bolster local production capability.

The city's green drive dates back to 1990 when the city government adopted successive plans to green the city, these plans culminating in the “Eco City Building Plan of Rizhao 2001-2020” in 2003 (ICLEI, 2012: 2). This plan was implemented in phases and covered the period 2001 to 2020 (ICLEI, 2012).

In the plan, the city government promoted investment in renewable energy technologies, supported by the Shandong government through policies and regulations

like the Regulations on Implementing Solar Energy and Construction Integration which standardised the use of solar energy in new buildings (ADB, 2010: 2). Funding for R&D of the local solar energy (photovoltaic and thermal heating) industry was also provided with the objective of making available lower cost hardware that are more competitive with traditional heating. Subsidies were also provided to households and businesses to retrofit their premises with solar energy equipment. In launching these initiatives, Rizhao is fully a decade ahead of the national Renewable Energy Law passed in 2006 that provided further subsidies, R&D funds and other incentives to promote renewal energy technologies throughout China.

Beyond popularising solar energy use through R&D and subsidies, the Rizhao government also sought to shut down or move out of the city enterprises that use coal or had energy-intensive central heating (Biello, 2008). Food, furniture and other industries had been moved to industrial parks outside the city while polluting industries like quarries had been shut down, the city finding alternative work for the displaced workers (An, 2012).

A third part of the city's strategy consists of giving substance to "the circular economy" in production. In the production of citric acid, the methane that is produced by "biodigesters" turning corn and sweet potato to citric acid is burned to run generators producing electricity. Similarly biodigesters, half the cost of which is met by the government, turn pig dung into methane which is used to warm greenhouses (Biello, 2017).

More than government initiatives, Huang, Broto, Liu and Ma (2018, pp. 226-229) and World Future Council (2010) argued that several facilitating factors were critical to the rapid adoption of solar energy by the city. One was the proximity of a local solar energy industry. Another was state collaboration with this industry to successfully market the solar energy solution that Huang, Broto, Liu and Ma (2018, p. 228) referred to as "social-spatial embeddedness" to the point where residents were willing to put up with the inconveniences of solar energy. This process was self-reinforcing, fostering learning and adaptation among all the stakeholders involved (Huang, Broto, & Liu, 2018, 163).

These joint efforts have borne fruit. By 2009, Rizhao was able to apply for the UN Habitat Scroll of Honor (Rizhao Municipal People's Government, 2009). By 2010, the ADB (2010) reported that in the city of nearly 3 million inhabitants:

- 99% of households in the central district and more than 30% of residences in the rural areas have installed solar water heaters.
- More than 500,000 sq m of PV panels have been installed within the city for heating, saving the city an estimated 0.5 megawatts in electric water heaters.
- More than 6,000 households use solar cookers.
- Most traffic signals, street and park lights use low-energy technologies such as LED lights and are powered by solar PV cells.
- Methane gas generated from agricultural and industrial waste water is used in place of coal as an energy source by more than 15,000 households.

Kwan (2009) estimated that by that time, about half the city's population had benefited from Rizhao's move to renewable energy. Further progress had been reported in 2012 (ICLEI, 2012, p. 4). Undoubtedly, solar energy use had been boosted by the

success in bringing down equipment costs – Levesque (2007) noted that “solar water heaters now cost the same as electric alternatives, roughly \$190 (4-5% of the annual average income of a household in town, 8-10% of a rural household's income) and save users money in the long run.” Biello (2008) added that they also saved about 348 million kilowatt-hours of electricity a year.

Despite these advances, carbon neutrality remains an unrealised goal, daunting challenges preventing its achievement. These challenges have arisen from factors outside its control as well as goal conflict. The fact that Rizhao is also an important port, the ninth largest in China, means that marine haze is produced (Biello, 2017). It is also an issue of goal conflict. Even as Rizhao attempts to go green, the port is an important source of revenue for the city.

But other areas of conflict exist too. Another major source of revenue is tourism. An estimated 2.7 million tourists visited Rizhao in 2017 bringing with them heightened traffic congestion and pollution. As the city becomes wealthier, the ownership of cars has grown apace, leading to a deterioration in air quality that offsets the government's efforts to clean up industry and power generation. Thus goal conflict is experienced by the government as a major stakeholder but also between stakeholders – the government and the residents of the city.

A final challenge relates to the larger environment in China. Unless the environmental quality improves, especially in areas close to the city, Rizhao cannot escape the airborne pollution blown in from other areas or river pollution from sources outside the city. Even the city's solution of relocating industries is at best temporary relief – keeping the city clean at the expense of the surrounding countryside.

These challenges arise because Rizhao was not designed as an eco-city but chose to become one. Other examples of purpose-built cities exist, Caofeidian near Tianjin (Zhang, 2010), Dongtan near Shanghai and Huangbaiyu in Liaoning being notable examples (Hald, 2009, pp. 70-76, 79-82). While hailed as “a sound model for future urban development” (Zhang, 2010, p. iv), these purpose-built cities have their own problems, including high construction costs, rendering them no more viable than Rizhao (Biello, 2017; Hald, 2009, pp. 82-83).

5. Leveraging Cultural and Historical Assets

Whereas the economic, social and political dimensions of development have been extensively discussed, it is increasingly recognised that culture is also embedded in the development process (Duxbury et al, 2016, p. 6). Cultural sustainability, keeping the past alive, is therefore an integral part of sustainable development (Soini & Birkeland, 2014, p. 213).

Rizhao is well aware of its cultural assets and have used these to promote tourism as a major source of income. The Rizhao Municipal Government reported that for 2016, over 200 construction projects at an investment cost of RMB12.7 billion for the city's cultural industry were launched, and was expected to increase the city's GDP by 2.24% (Rizhao MPG, 2017).

Its development plan consists of “one belt and three clusters” (Rizhao MPG, 2017). The belt is the “cultural and tourist belt of Rizhao sunshine coast”. The clusters cater to

the cultural innovations, sun culture industry and the industry covering specific cultural assets like black pottery.

These plans seek to reinforce a city brand built on a number of cultural awards. These awards include: Chinese Outstanding Tourism City, National Garden City and Capital of Water Sports (KPMG, 2017, p. 4).

These awards reflect Rizhao's possession of a wealth of cultural assets. Historically, Rizhao is the main birthplace of the "Longshan culture" that flourished between 2,600 and 1,900 BC, an outstanding example of a late Neolithic community. While excavations continue, significant finds have been made that give clues to agriculture in that period (Crawford et al., 2005). In terms of crafts, the Rizhao black pottery dates from the Longshan culture and ancient pieces are highly valued. This craft has survived to this day, and over 10 large scale black pottery factories employ local potters who combine ancient artistic concepts with modern technology to ensure the preservation of this ancient heritage (Zhao, 2003).

The ancient sun worship culture is another area of focus for Rizhao's cultural tourism ("Sun culture tourism", 2017). Going back millennia, sun worship had developed folk traditions as well as provided specific locations of historic significance. A recreation of a ceremony to welcome the sun has been held annually at dawn on New Year's Day since 2010, attracting a large number of tourists. In Rizhao's Tiantai Mountain scenic area was the cradle of the Dongyi civilization that, while not as ancient as the Longshan culture, had existed there from the Neolithic period to the time of the Western Zhou Dynasty (1046-771 BC). This was the birthplace of ancient sun worship. Leveraging this rich history, Rizhao has branded itself "Sun City of the East".

This wealth of cultural assets has proven to be both a blessing and a challenge. While the Rizhao city government is spoilt for choice in selecting activities to promote its tourism drive, the need to choose implies that resources are insufficient to cover all cultural assets, major or otherwise. This poses a challenge to cultural or heritage preservation, now considered an integral part of sustainable development (Soini and Birkeland, 2014).

A good example of inadequate state coverage is the Fishermen's Festival and its Shui Dance (Figure 3). This festival has more than local significance, being held in five cities in China and listed in China's "National Intangible Cultural Heritage List" (Song, 2010). Held annually on the 13th day of the sixth month of the lunar calendar, the festival gives thanks to the sea spirits for the fishermen's safety over the past year and offers prayers for a bountiful catch the coming year. One of 4 activities in the festival, the Shui folk dance performed by fishermen themselves sees dancers dressed up in colourful costumes representing sea creatures. This dance was proclaimed by the Rizhao government as an Intangible Cultural Heritage in 2008.

Despite its significance, this activity is not included in the Rizhao government's development planning outlined above. Indeed, supported only by the Rizhao Culture Museum, the Shui dance lacks performance venues, remuneration for performers, and most of all, choreography, routines and training to upgrade the rather poor performance standards. In these circumstances, the sustainability of this performance cannot be assured unless alternative support avenues are found.



Figure 3. The Shui (aquatic) Dance of the Fishermen's Festival
Source: Photo by authors

6. Conclusion

Rizhao, now a prefectural city, but with a history going back millennia, has both benefited and been disadvantaged by geography. Its location on the south coast of Shandong province has facilitated its growth as a port while also sheltering it from the cold winds from the north. It is well-known for the large number of sunny days. And its situation among ancient civilizations has endowed it with a rich cultural history. At the same time, its proximity to nearby cities like Qingdao and Weihai that are recipients of strong provincial support has left it playing catch-up economically, while its location in Shandong Province, one of the most industrialised regions in China has left it susceptible to environmental pollution.

These opportunities and challenges are recognised by the Rizhao municipal government, which, like in many other Chinese cities, has played an important role in shaping the city's growth. Framed by national and provincial plans, its efforts at catch-up are reflected in its consistent drive to develop its port facilities while early efforts to attract labour-intensive industry have been replaced by measures to promote service sector enterprises and high-tech industries. However, until it embarked on leveraging

its unique assets – its solar energy potential and rich historical heritage – to promote its sustainability role, it did not distinguish itself as a city model of promise. Once it took this breakaway approach, however, it not only showed the way towards a sustainable future but also demonstrated the importance of leveraging unique assets as part of a city's strategy for development.

As with other aspects of development, the city government's two-pronged strategy comes with both opportunities and challenges. The opportunities emanate from the city's rich historical heritage that can support a thriving tourist industry. The many days of good weather undoubtedly helps. At the same time, the Rizhao government is faced with the challenge of abundance – there is just too vast a stock of assets for its limited resources to promote.

The abundance of sunshine must clearly be associated with the historical sun-worship, the modern-day tourism, but above all, the growth of the solar energy industry and system put in place in the city. The success of Rizhao's solar energy ecosystem can be credited to the Rizhao municipal government only partially; perhaps more important is support from the solar power industry located in the vicinity of the city and city residents' familiarity with the sun as a potential power source. Could this public-private cooperation also have worked for ensuring cultural sustainability?

Finally, the question of whether Rizhao is China's urban future needs to be addressed. To the extent that the Rizhao eco-system is the outcome of changes to a system that has left all kinds of imperfections intact, the Rizhao model is far from perfect. The model itself contains logical contradictions – promoting port activity and tourism both damage the city's green credentials. At the same time, alternative models, not least of which are purpose-built eco-cities, have not done better. Rizhao at least showcases stakeholder cooperation that is a key ingredient of success. And if the feasible future lies in turning existing cities green rather than building new eco-cities, China's urban future likely lies with Rizhao, its many drawbacks notwithstanding, although adaptations and compromises will be needed to suit specific contexts. This future is now articulated in the concept of "ecological civilisation" announced by Xi Jinping at the 19th National Party Congress in 2017 (Xiao and Zhao, 2017). Warts and all, Rizhao's efforts has garnered both national and international endorsement.

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